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(54) TAPE RECORDING MEDIUM, CONTROL INFORMATION GENERATING  
DEVICE, AND CONTROL INFORMATION DECODING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To make it possible to record data in a computer file form into a DVC(Digital Video Cassette) by recording the volume entry, directory entry and file entry which are the information for controlling volumes, directories and files in a control information recording area.

SOLUTION: A volume entry generator 2, a directory entry generator 3 and a file entry generator 4 renew the volume entry and the directory entry of the control information about the file data (file A) of the first accumulating medium such as the hard disk inputted from the first accumulating medium control information outputting instrument 12 and prepare a novel file entry for the file A. A control information generating instrument 10 records the control information and the file A after renewal into the DVC through a recording/ reproducing device 6. By this, data in the file form can be treated by a magnetic tape medium such as DVC.

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## CLAIMS

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### [Claim(s)]

[Claim 1] The tape-recording medium characterized by recording the data control information which is the information which manages the data currently recorded on the tape-recording medium on the position of said tape-recording medium, and restricting the amount of the maximum records of the above-mentioned data control information in said tape-recording medium.

[Claim 2] Are management information generation equipment which generates data control information, and consider the minimum configuration unit of record playback data as a file, and the maximum configuration unit of record playback data is made into volume. Use said volume as the first layer and the second layer is made into a root directory. Even the M ( $M \geq 3$ ) following layers are constituted from the two or more floor layer used as the file and the directory. the 3rd layer or subsequent ones -- the -- Make an informational unit into an entry and information which manages said volume is made into a volume entry. Make into a directory entry information which manages said directory, and information which manages said file is made into a file entry. The information about the entry of a root directory is recorded on said volume entry. The 2nd directory which is the directory entry of the directory of others [ directory entry / said ], Or the information about said file entry is recorded and the 2nd file entry information which is the entry of the 2nd file which is other files is recorded on said file entry. Management information generation equipment characterized by recording said volume entry, said directory entry, and said file entry on the management information record section in a tape-recording medium.

[Claim 3] Management information generation equipment according to claim 2 characterized by for one volume entry corresponding to one volume, for one directory entry corresponding to one directory, and one file entry corresponding to one file.

[Claim 4] The identifier of the record medium ID and volume which identify a record medium, the additional memory information which is the information on the additional memory which is the recording device added to the record medium, The management information sheep record section information which shows the non-record section in the newest update information which is the time amount which updated the contents of the record medium, the data-logging positional information which is the record location which recorded record playback data on the record medium, or a management information record section, The thing which exist altogether and for which it is, and it crawls and it is recorded on the volume entry whether it is a gap, And the directory

attribute which shows the attribute of a directory, renewal time amount of a directory which is the updating time amount of a directory, the [ the directory name which shows the identifier of a directory, and ] -- the directory entry of the L ( $L \geq 3$ ) following layer directory -- the number of the directory entry of the \*\* ( $L+1$ ) following layer directory -- Or the contents entry number which is a number of the file entry of the \*\* ( $L+1$ ) following layer file, the -- the directory entry of the M ( $M \geq 3$ ) following layer directory -- the number of the directory entry of the Mth layer directory -- The NeXT entry number which is a number of the file entry of the Mth layer file, Or [ whether it is recorded on the sector whose one directory entry is the amount-of-information unit of one entry, and ] Or the thing of the continuation flag which shows whether it is recorded ranging over two or more sectors which exist altogether and for which it is, and it crawls and it is recorded on the directory entry whether it is a gap, And the file attribute which shows the attribute of a file, file updating time amount which is the updating time amount of a file, The file ID which identifies the file name which shows the identifier of a file, the NeXT entry number, and a file Management information generation equipment according to claim 2 or 3 with which a file size and a file are characterized by the thing of the file position which shows the positional information currently recorded on the record medium, or a continuation flag which exist altogether, and for which it is, and it crawls and it is recorded on the file entry whether it is a gap.

[Claim 5] Management information generation equipment according to claim 2, 3, or 4 characterized by including the NeXT nothing flag which shows the same hierarchy the case where there is not a file or a directory in a directory entry and a file entry.

[Claim 6] the -- the management information generation equipment according to claim 2, 3, 4, or 5 characterized by including the contents nothing flag which shows that the \*\* ( $P+1$ ) following layer directory and file which the P ( $P \geq 3$ ) following layer directory manages do not exist in a directory entry.

[Claim 7] Management information generation equipment according to claim 2, 3, 4, 5, or 6 which a sector is the record unit of the entry recorded on a management information field, and is characterized by restricting said number of sectors.

[Claim 8] It is management information generation equipment according to claim 2 to 7 characterized by investigating the sheep record section information in a management information field in a volume entry when adding a file or a directory newly, newly adding the entry of a file and a directory to the sheep record section in a management information field, updating the sheep record section information in a management information field, and updating the sheep record section information in a management information field when deleting a file or a directory.

[Claim 9] the -- the management information generation equipment according to claim 2 to 8 characterized by rewriting the NeXT flag or the NeXT nothing flag of the file of the contents flag of the directory of the \*\* (Q-1) following layer, a contents nothing flag, and the Qth layer, or a directory when adding or deleting a file or a directory newly in the Q (Q>=3) following layers.

[Claim 10] Management information generation equipment according to claim 2 to 9 characterized by recording the identification information of a record medium on a volume entry.

[Claim 11] Management information generation equipment according to claim 2 to 10 characterized by recording a volume name on a volume entry.

[Claim 12] Management information generation equipment according to claim 2 to 11 characterized by recording informational a part or informational all that is being recorded on the 2nd record medium on a volume entry.

[Claim 13] Management information generation equipment according to claim 2 to 12 characterized by recording the record location in the record medium of a volume entry.

[Claim 14] Management information generation equipment according to claim 2 to 13 characterized by recording the attribute of a directory on a directory entry.

[Claim 15] Management information generation equipment according to claim 2 to 14 characterized by recording a directory name on a directory entry.

[Claim 16] Management information generation equipment according to claim 2 to 15 characterized by recording a file attribute on a file entry.

[Claim 17] Management information generation equipment according to claim 2 to 16 characterized by recording a file name on a file entry.

[Claim 18] Management information generation equipment according to claim 2 to 17 characterized by recording the class of signal recorded on a file entry.

[Claim 19] Management information generation equipment according to claim 2 to 18 characterized by recording the class of equipment recorded on a file entry.

[Claim 20] Management information generation equipment according to claim 2 to 19 characterized by recording the class of signal recorded on a file entry.

[Claim 21] Management information generation equipment according to claim 2 to 20 characterized by recording the record location in the record medium of a file entry.

[Claim 22] The tape-recording medium which is a tape-recording medium by which data control information was recorded, and is characterized by recording the volume entry, the directory entry, and the file entry on the management information record section in said tape-recording medium.

[Claim 23] The tape-recording medium according to claim 1 or 22 characterized by

storing the data control information currently recorded on the tape-recording medium in memory in case a tape-recording medium and other record media are connected and data are transmitted and received.

[Claim 24] The tape-recording medium according to claim 22 or 23 characterized by for one volume entry corresponding to one volume, for one directory entry corresponding to one directory, and one file entry corresponding to one file.

[Claim 25] The thing of a record medium ID, the identifier of volume, additional memory information, the newest update information, data-logging positional information, or management information sheep record section information which exist altogether and for which it is, and it crawls and it is recorded on the volume entry whether it is a gap, And the thing of a directory attribute, the renewal time amount of a directory, a directory name, a contents entry number, the NeXT entry number, or a continuation flag which exist altogether and for which it is, and it crawls and it is recorded on the directory entry whether it is a gap, And a file attribute, file updating time amount, a file name, the NeXT entry number, The tape-recording medium according to claim 22, 23, or 24 characterized by the thing of File ID, a file size, a file position, or a continuation flag which exist altogether, and for which it is, and it crawls and it is recorded on the file entry whether it is a gap.

[Claim 26] The tape-recording medium of the publication according to claim 22, 23, 24, or 25 characterized by including the NeXT nothing flag in a directory entry and a file entry.

[Claim 27] Claims 22-26 characterized by including a contents nothing flag in a directory entry are the tape-recording media of a publication either.

[Claim 28] Claims 22-27 characterized by restricting the number of entries recorded on a management information field are the tape-recording media of a publication either.

[Claim 29] It is the tape-recording medium according to claim 22 to 28 characterized by investigating the sheep record section information in a management information field in a volume entry when adding a file or a directory newly, newly adding the entry of a file and a directory to the sheep record section in a management information field, updating the sheep record section information in a management information field, and updating the sheep record section information in a management information field when deleting a file or a directory.

[Claim 30] the -- the tape-recording medium according to claim 22 to 29 characterized by rewriting the NeXT flag or the NeXT nothing flag of the file of the contents flag of the directory of the \*\* (Q-1) following layer, a contents nothing flag, and the Qth layer, or a directory when adding or deleting a file or a directory newly in the Q (Q>=3) following

layers.

[Claim 31] Management information decode equipment which is management information decode equipment which decodes the data control information recorded on the tape-recording medium, and is characterized by decoding a volume entry, a directory entry, and a file entry.

[Claim 32] The thing of the record medium ID in a volume entry, the identifier of volume, additional memory information, the newest update information, data-logging positional information, or management information sheep record section information which exist altogether and for which it is, and it crawls and decodes whether it is a gap, And the thing of the directory attribute in a directory entry, the renewal time amount of a directory, a directory name, a contents entry number, the NeXT entry number, or a continuous flag which exist altogether and for which it is, and it crawls and decodes whether it is a gap, And the file attribute in a file entry, file updating time amount, a file name, Management information decode equipment according to claim 31 characterized by the thing of the NeXT entry number, File ID, a file size, a file position, or a continuous flag which exist altogether, and for which it is, and it crawls and decodes whether it is a gap.

[Claim 33] Management information decode equipment according to claim 31 or 32 which decodes the NeXT nothing flag in a directory entry and a file entry.

[Claim 34] Management information decode equipment according to claim 31, 32, or 33 which decodes the contents nothing flag in directory ENTO.

[Claim 35] The program documentation medium characterized by storing the program for realizing all or a part of each functions which management information generation equipment according to claim 2 to 21 performs.

[Claim 36] The program documentation medium characterized by storing the program for realizing all or a part of each functions which management information decode equipment according to claim 31 to 34 performs.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the tape-recording medium used for record playback of data. Moreover, in case this invention outputs the management information generation equipment which has the function which generates management information required [ in case an image and voice data are recorded on a computer ] in order that a computer may manage an image and voice data, and record data, it relates to management information decode equipment with the function to decode said management information.

[0002]

[Description of the Prior Art] There is DVC (Digital Video Cassette) using the magnetic tape as a medium which accumulates the multimedia information containing current, an image, and voice. This DVC is connected with a computer and using as an are recording medium for computers is examined like the existing hard disk, the floppy disk, etc.

[0003]

[Problem(s) to be Solved by the Invention] When treating the data of the existing are recording medium by file format, by the hard disk and the floppy disk, methods (it is hereafter called a file system) peculiar to each are recording medium, such as CDFS, exist in FAT (File Allocation Table) and CD-ROM. However, the file system for DVC does not recognize current existence.

[0004] It is possible to adopt the existing file systems, such as FAT and CDFS, as DVC here. However, FAT and CDFS are file systems for media in which random access, such as a magnetic disk and a magneto-optic disk, is possible, and if the above-mentioned existing file system is adopted by the medium whose serial access is a base like magnetic tapes, such as DVC, fault -- access takes time amount -- will produce them.

[0005] This invention aims at realizing the management information decode equipment which reads the management information which realizes the file system of DVC in order to manage the file which recorded data and recorded on DVC in the computer filing format, creates the realized file system \*\*\*\*\* management information, and is recorded on the position of a tape, and which and was recorded. [ management information generation ]

[0006]

[Means for Solving the Problem] In order to solve this technical problem, this invention is management information generation equipment which generates data control information. Consider the minimum configuration unit of record playback data as a file, and the maximum configuration unit of record playback data is made into volume. Even



the M ( $M \geq 3$ ) following layers are constituted from the two or more floor layer used as the file and the directory. volume -- the first layer -- carrying out -- the second layer -- a root directory -- carrying out -- the 3rd layer or subsequent ones -- the -- Make an informational unit into an entry and it considers as the volume entry which is the information which manages volume. Consider as the directory entry which is the information which manages a directory, and it considers as the file entry which is the information which manages a file. The information about the entry of a root directory is recorded on said volume entry. The \*\* directory which is the directory entry of the directory of others [ directory entry / said ], Or the information about said file entry is recorded and the 2nd file entry information which is the entry of the 2nd file which is other files is recorded on said file entry. It has recording said volume entry, a directory entry, and a file entry on the management information record section in a tape-recording medium.

[0007] Moreover, this invention is management information decode equipment which decodes the data control information recorded on the tape-recording medium, and is equipped with decoding a volume entry, a directory entry, and a file entry.

[0008] According to this invention, also in magnetic tape media, such as DVC, the data of file format can be dealt with like magnetic-disk media, such as the conventional hard disk, a floppy disk, and CD-ROM. Moreover, it becomes possible to create the management information for managing the data of file format, and to read the created management information.

[0009]

[Embodiment of the Invention] The gestalt of operation of this invention is explained using drawing 1 , and 2, 3, 4, 5, 6 and 7 below.

[0010] (Gestalt 1 of operation) a block diagram [ in / in drawing 1 / the gestalt 1 of operation of this invention ] -- being shown -- drawing 1 -- setting -- 1 -- an input device and 2 -- a volume entry generation machine and 3 -- for a record regenerative apparatus and 10, as for the 1st are recording medium and 12, the renewal machine of management information and 11 are [ a directory entry generation machine and 4 / a file entry generation machine and 6 / the 1st are recording media-administration-information output machine and 30 ] management information generation equipment. In addition, management information generation equipment 30 consists of the volume entry generation machine 2, a directory entry generation machine 3, a file entry generation machine 4, and a renewal machine 10 of management information. Henceforth, what the same number attached shall have the same configuration and the same function.

[0011] About the management information generation equipment constituted as mentioned above, the actuation is described hereafter.

[0012] A transfer of the file data (it is hereafter called File A) from the 1st are recording medium 11 to the renewal machine 10 of management information is considered. In addition, the 1st are recording medium assumes the existing are recording media, such as a hard disk, a floppy disk, and CD-ROM. Moreover, the data transfer from the 1st are recording medium 11 to the renewal machine 10 of management information shows the thing to the renewal machine 10 of management information to copy (hereafter referred to as COPY) for the file A currently recorded on moving the file A currently recorded on the 1st are recording medium 11 to the renewal machine 10 of management information (hereafter referred to as MOVE), or the 1st are recording medium 11. The are recording medium which has a recording device 6 here is called the 2nd are recording medium. Moreover, to the 2nd are recording medium, it shall have an auxiliary storage unit like Media Interface Connector (memory Inca set) of DVC apart from the are recording medium of a body.

[0013] The file A inputted into the renewal machine 10 of management information is inputted into an input unit 1. Moreover, the management information about File A inputs into an input unit 1 from the 1st are recording media-administration-information output machine 12. The management information about the file A inputted into the input device 1 is inputted into the volume entry generation machine 2, the directory entry generation machine 3, and the file entry generation machine 4.

[0014] In addition, by the 2nd are recording medium, the file to record has volume, a root directory, a directory, and the layered structure of a file, and only one root directory which accomplishes the root of a directory exists in one volume. Moreover, under the  $n$ -th hierarchy's directory, a  $(n+1)$  hierarchy's file or directory can be existed. In addition, under a directory, a file or a directory may not necessarily exist.

[0015] Moreover, one file entry, one directory entry, and one volume entry exist in one file, one directory, and one volume as management information, respectively. All related fill entries, a directory, and a volume entry are made to cooperate to a record regenerative apparatus (or record medium which a record regenerative apparatus holds), and it considers as management information. Each entry makes a unit the sector which consists of 64 bytes, and one entry consists of one or more two or more sectors. For example, in order to manage the data recorded on home digital one VCR "DVC" using the management information generated by the gestalt of this operation, it is necessary to record management information on a DVC tape. If an approach as shown

in Japanese Patent Application No. 9-67633 is used, 64 bytes of data are recordable by making into a physical sector (physical sector) Sync block which is the minimum record unit. Then, if each entry is divided per 64 bytes and it is made to assign one or more sectors, the entry which is a logical record unit, and the sector which is a physical record unit can be adjusted, and it will become easy to carry out information revival processing when an error occurs etc. In addition, the information which shows that no sector follows Sector C next again in the information which shows that Sector C follows Sector B next again in the information which shows that Sector B follows Sector A next when one entry is constituted from a sector A in case one entry is constituted from two or more sectors, a sector B, and a sector C is specified, respectively.

[0016] The tape ID in which the 2nd are recording medium top is shown with the volume entry generation vessel 2 The volume name which shows the identifier of the volume which is the greatest unit of the data recorded on the 2nd are recording medium, The auxiliary record data which are some data of the auxiliary storage unit of the 2nd are recording medium, The renewal time amount of the newest which is the newest time amount which updated the data in the 2nd are recording medium (an addition is also included), The management information record positional information which is the positional information on the 2nd are recording medium which is actually recording management information, The management information intact positional information which shows the location of a free space in the field which records the management information on the intact positional information which is the information on a still intact location, and the 2nd are recording medium by that on the 2nd are recording medium is generated.

[0017] With the directory entry generation vessel 3, the directory name which shows the identifier of the continuous flag and directory in which it is shown whether the NeXT entry number which is a number of the directory of the same hierarchy as the contents entry number and directory which are the number of the file under the attribute of a directory, the renewal time amount of the newest of a directory, and a directory or the entry of a directory, or the entry of a file, and a directory entry consist of two or more sectors is generated.

[0018] AV data attributes, such as a tape speed in which the attribute of a file and the 2nd are recording medium record are possible with the file entry generation vessel 4, The 2nd are recording medium attribute, ID of a file depending on a record format of the 2nd are recording medium, The renewal time amount of the newest of a file, a file size, the file record location in the 2nd are recording medium, The identifier of the continuous flag which shows whether the NeXT entry number which is a number of the

directory of the same hierarchy as a file or the entry of a file, and a file entry consist of two or more sectors, and a file is generated. By forming a continuous flag for every sector, correspondence to a long file name can be performed efficiently, for example.

[0019] As information except having described above, Version information is for managing the version of the format, when the information on such an entry has been improved, for example. When storage capacity information sets up the value which shows tape length when a record medium is a tape, residue count of a record medium is attained. Log information leaves the generating situation of an error, and the busy condition/environment of a tape as information, and enables quality control for reading data from a record medium certainly.

[0020] When the auxiliary record medium is attached to the 2nd record medium, let some data made to record on a secondary memory medium be auxiliary information. If it is Media Interface Connector (Memory In Cassette) of DVC, APM (Application ID on Media Interface Connector) of a triplet, 5-bit BCID (Basic Cassette ID), 5 bytes of Cassette ID Pack, 5 bytes of Tape Length Pack, and 5 bytes of Title End Pack will be assigned to 16 bytes of head of this memory. The information about the capacity of this memory or the record last location of a tape is acquired by these. When it records with the equipment which cannot carry an auxiliary record medium after recording with the equipment which can once treat an auxiliary record medium, when there are equipment which can treat an auxiliary record medium, and equipment which cannot be carried, an inconsistency will be made to the contents of the auxiliary record medium which exists in order to manage the contents of the tape, and it. Since the auxiliary information in a volume entry is set as the value which should be essentially recorded on an auxiliary record medium although an auxiliary record medium is not updated when setting 16 bytes of information which should be recorded on the above-mentioned Media Interface Connector head as the volume entry and it records with the equipment which cannot carry an auxiliary record medium, it can check that there is an inconsistency, if the equipment which cannot carry an auxiliary record medium again compares both information.

[0021] Record formal information is generated as information other than the above. For example, although the fundamental record format to a tape top is the same in DVC The image for low rate record of the image of SD (NTSC, PAL system), and SD in a part for data division, It has compression/record format of a proper in each, such as an image of HD (HiVision), and an image of MPEG. When treating as a file the image recorded by the method of DVC as it is What is necessary is for the information about this record format to be required in order to know what kind of data this file is, and just to use

STYPE specified as a record format of DVC, and the signal called 50/60 bit as record formal information. Moreover, recording density information is information required in order that record by narrow track width of face may be intermingled and storage capacity and a record location may manage by image record devices including DVC because of record by the standard width of recording track, and long duration record. File copyright information shows the copyright of the data of this file. As a value, information like CGMS (Copy Generation Management System) can be used, for example. CGMS -- by 2-bit data, Copy prohibition and 10 mean CopyOK and 00 means [ 11 ] Copy freedom only once. It is also possible to give a definition to a file and to give a definition to each of an image/voice.

[0022] As directory attribute information and file attribute information, if the same thing as what is used by usual HDD and usual CD-ROM will be used, ON/OFF of each bit can show read-only (read only), whether they are a hidden file (hidden file), a system file (system file), and a directory, or there is nothing, and discernment of a file entry and a directory entry can also be performed to coincidence, for example. (If there is no bit of a directory in attribute information, a file / directory discernment flag is required for each entry.) About data-logging positional information, when DV is used, for example, it is possible to express using the absolute address (Absolute Track no.) set up for every track. That is, since what is necessary is just to access the absolute address directly when it records, and is going to check how far it has recorded and is going to carry out appending record at data-logging positional information, then a degree, it is not necessary to perform excessive processing.

[0023] The information about File A inputs into the volume entry generation machine 2, the directory entry generation machine 3, and the file entry generation machine 4 from the 1st are recording media-administration-information output machine 12 like the gestalt of this operation, and a new file entry is created the renewal of a volume entry and a directory entry, and for file A. It is updated with the renewal vessel 5 of management information from the management information before File A inputs into the management information updated, or added and deleted with each volume entry generation machine 2, the directory entry generation machine 3, and the file entry generation vessel 4. The management information and File A after updating are recorded on a recording device 6.

[0024] Here shows the approach of renewal of the management information using an entry, an addition, and deletion. Drawing 2 illustrates volume, a directory, and the layered structure of a file, and drawing 3 shows each entry of the volume of drawing 2 , a directory, and a file. In drawing 2 , in ROOT, a volume name, DIR1, DIR2, DIR3 and

SUB11, SUB12.SUB13, and SUB31, SUB111 and SUB131 show a directory name, and, as for a root directory and VOLUMEX, FILE14, FILE112, FILE113, and FILE132 show a file name. The file name of the file entries, a file attribute, and the NeXT entry number are shown [ the volume name of the information recorded on a volume entry for explanation, and management information intact positional information ] for the directory name of the directory entries, a directory attribute, a contents entry number, and the NeXT entry number in drawing 3 . In addition, it is shown that Y of the column of a directory attribute and a file attribute has effective directory of the entry or file.

[0025] The contents entry number of a directory entry shall choose any one in the file which belongs to the directory, or a directory (contents), and shall set up the entry number of the entry of the selected contents. When there are no contents, the value which shows that there is nothing is set up. As this value, the entry number of a volume entry can be used, for example. In addition, the value beyond the maximum as an entry number which can be taken can be set up, or the flag which shows the existence of contents can also be set up independently.

[0026] Moreover, the address of a sector can be used as an entry number. Since each entry is assigned to one or more sectors, when it sets in order to an entry, where [ of management information ] it becomes cannot judge immediately, but if it is the address of a sector, it is a location absolutely and the analysis of the whole management information is easy.

[0027] In registering these entries into management information, it is possible to set a volume entry at the head first, to pack the directory entry and the file entry after that, and to consider as the address of a sector also with management information free-space information. Thus, if it arranges, the volume entry which has only one piece to management information will be in the always same location, and the analysis of management information will become easy. Further Since the root directory which is in the most significant in the layered structure of a directory/file serves as criteria, if the directory entry (it is hereafter called a root entry) of a root directory is registered into the location which follows a volume entry by management information, the analysis of management information will become easy.

[0028] In drawing 2 and drawing 3 , the contents entry number is set to a nothing flag and NF by directories DIR2, SUB12, and SUB131. This shows not having a directory or a file under each directory. moreover -- seeing the directory under the same hierarchy under DIR1, and the NeXT entry number of a file -- SUB11 -- 6 -- 13 is recorded on SUB13 and NF is recorded for 7 on FILE14 at SUB12. In addition, the number which is not used for an entry number, 0 [ for example, ], and a negative value are assigned to NF.

[0029] In the case of SUB11, SUB12, and SUB13, this shows the directory which each adjoins, or the entry number of a file, and it is shown that FILE14 is the directory of the last under DIR1 or a file. The layered structure at the time of recording File A on the bottom of DIR1 here is shown in drawing 4 , and the entry in that case is shown in drawing 5 .

[0030] By adding File A from drawing 3 and drawing 5 to the bottom of DIR1, the NeXT entry number of FILE14 is set to 15 from NF, and the NeXT entry number of File A serves as NF. Moreover, the management information intact positional information of a volume entry is changed into 15 from 14.

[0031] In the directory entry used in the gestalt of this operation as mentioned above, and a file entry, other directories, the contents entry number of a file, or the NeXT entry number surely points to all directories and files only once.

[0032] the directory or file in which the NeXT entry number of a directory entry belongs to the directory (parent directory) to which this directory belongs -- choosing -- the -- although chosen, the entry number of an entry is set up. When choosing, what was specified by the thing specified by the contents entry number of the entry of a parent directory, the file which already belongs to the same parent directory, or the NeXT entry number of the entry of a directory shall be avoided and chosen, and the same file or the same directory is not specified twice or more. If what is not chosen among the file which belongs to a parent directory, or the directory is lost, it will be set as the value which shows that there is nothing about the NeXT entry number of the entry of the contents chosen at the end. As this value, the entry number of a volume entry can be used, for example. In addition, the value beyond the maximum as an entry number which can be taken can be set up, or the flag which shows the existence of contents can also be set up independently, or the flag which shows the existence can also be set up independently. The NeXT entry number of a file entry can be set up like the above-mentioned directory entry.

[0033] In addition, it is also possible to restrict the total number of sectors which constitutes volume, a directory, and each entry of a file in the gestalt of this operation to the number of arbitration. The upper limit of the amount of management information on the 2nd are recording medium can be restricted with restricting. Moreover, access becomes quick, also in case all management information is read at once and information is updated.

[0034] Next, the updating approach of the management information at the time of deleting the directory in management information or a file is shown. For example, when FILE112 in drawing 2 is deleted, it is attached instead of M which shows that the file is

invalid to the column of the file attribute of FILE112 being Y. Moreover, the NeXT entry number of SUB111 which is the same tree directory under a directory SUB 11 is set to 13 [ of the entry number of FILE112 ] of the entry number of 12 to FILE113 because FILE112 became an invalid. Moreover, when SUB131 and FILE132 are deleted, the directory attribute of SUB131 and the file attribute of FILE132 are set to M, and the contents entry number of SUB13 which is the directory of the right above of it serves as NF.

[0035] As mentioned above, with the gestalt of this operation, it becomes possible to deal with the data of file format in magnetic tape media, such as DVC.

[0036] (Gestalt 2 of operation) Drawing 6 shows the block diagram in the gestalt 2 of operation of this invention, and, for a management information ejection machine and 21, as for a display and 26, a management information decoder and 22 are [ 20 / the 2nd record regenerative apparatus and 31 ] decode equipment in drawing 6 . In addition, decode equipment 31 consists of a management information ejection machine 20, a management information decoder 21, and a 2nd record regenerative apparatus 26. Henceforth, what the same number attached shall have the same configuration and the same function.

[0037] About the management information decode equipment constituted as mentioned above, the actuation is described hereafter.

[0038] The field which records management information in a tape media are recording medium like DVC in the 2nd record regenerative apparatus 26 is specified. Drawing 7 shows one example of the tape media are recording medium in the 2nd record regenerative apparatus 26. 100 and 111 show a management information record section by drawing 7 , and 112 and 113 show a live-data record section, i.e., a file data record section. 110 shows the field where management information is already recorded among management information fields, receives here, and 111 shows the intact management information record section where management information is not recorded yet. Moreover, already 112 shows the field where - \*\* is recorded, receives by the file, and 113 shows the inactive-file data storage area where the file data is not recorded yet.

[0039] The management information currently recorded on the management information field is taken out with the management information ejection vessel 20. The taken-out management information is sent to the management information decoder 21. In addition, the volume entry which constitutes management information, a directory entry, and a file entry are taken as what was shown previously (gestalt 1 of operation), and the same thing. That is, it shall have the gestalt shown by drawing 2 and drawing 3 .



[0040] With the management information decoder 21, a volume entry is decoded first. That is, the tape ID which is ID of an are recording medium, a volume name, auxiliary record data which are some data of the auxiliary storage unit of an are recording medium, The renewal time amount of the newest in an are recording medium, the management information record positional information on the are recording medium which is actually recording the management information which is the head location of 110 in drawing 7 , The management information intact positional information which shows the location of a free space in the field which records the management information which is the head location of 111 of the intact positional information of a still intact location and drawing 7 on the are recording medium which is similarly the head location of 113 of drawing 7 is decoded.

[0041] Next, although the directory entry for a directory and the root directories located in the highest floor layer in a file organization layered structure (it is hereafter called a root entry) is decoded therefore, it is necessary to specify the location in the management information storage region of a root entry. By the directory entry, the attribute of a directory, the renewal time amount of the newest of a directory, a contents entry number, the NeXT entry number, a continuous flag, and a directory name are decoded including a root entry.

[0042] Moreover, in a file entry, the identifier of the attribute of a file, AV data attribute, the are recording medium attribute depending on a record format of an are recording medium, ID of a file, the renewal time amount of the newest of a file, a file size, the file record location in an are recording medium, the NeXT entry number, a continuous flag, and a file is decoded.

[0043] The configuration of a root directory, a directory, and a file is performed after decoding management information, it transmits to a display 22, and a layered structure is displayed. What was made to reflect the management information of drawing 3 in drawing 3 , and made some examples of management information the layered structure is shown in drawing 2 .

[0044] The NeXT entry number of a root directory serves as NF first. A root directory is a highest floor layer and this shows that the same hierarchy does not have other directories and a file. 2 shows the contents flag of a root entry. It turns out that the hierarchy directly under a root directory has DIR1 first by this. 4 3 which shows the directory entry of DIR2 indicates the directory entry of DIR3 to be to the NeXT entry entry of DIR2 again is decoded by the NeXT entry number of DIR1. Moreover, by the NeXT entry number of DIR3, NF which shows that a directory and a file do not exist any more at the same hierarchy is decoded. As a result, it is decoded by the hierarchy

directly under a root directory like drawing 2 that DIR1, DIR2, and DIR3 exist. Moreover, the contents flag of DIR2 serves as NF. This shows the hierarchy of DIR2 directly under that a directory and a file do not exist.

[0045] As mentioned above, with the gestalt of this operation, it becomes possible to decode the management information at the time of dealing with the data of file format in magnetic tape media, such as DVC.

[0046] In addition, the management information shown by drawing 3 or drawing 5 is recorded on the management information record section of drawing 7.

[0047] Moreover, the example of recording information in a directory entry is shown in drawing 9, and the example of the recording information in a file entry is shown for the example of the recording information in a volume entry in drawing 10 at drawing 8, respectively.

[0048] In drawing 8, the identification information of a tape is recorded on Tape ID. The identifier of each volume proper is recorded on a volume name. The copy of the part currently recorded in Media Interface Connector or all information is recorded on Media Interface Connector information. The time which finally updated volume information is recorded on last access time. The volume record location in a record medium is recorded on a start position. For an entry number, it is vacant and the smallest number of the non-recorded entries is recorded.

[0049] In drawing 9, a directory attribute is recorded on an attribute. The time which finally updated the directory entry is recorded on last access time. The information which shows that a directory and a file do not exist in a directory entry at the directory of a directory direct lower layer, the entry number of a file, or a direct lower layer to a contents entry number is recorded. The directory in the same layer as a directory, the entry number of a file, or the information that shows that a directory and a file do not exist to the same layer is recorded on the NeXT entry information. The sector number to continue when this entry constitutes ranging over two or more sectors, or the information which shows that a sector does not continue is recorded on a continuous flag. The identifier of a directory is recorded on a directory name. In drawing 10, a file attribute is recorded on an attribute. The information which shows the class of signal to record, for example, the compression method of a signal, is recorded on a data attribute. An equipment attribute records the information about the equipment to record. The time which finally updated the file entry is recorded on last access time. The magnitude of a file, for example, the bit length of a file, is recorded on a file size. A file position records the record location of the file in a record medium. The directory in the same layer as a file, the entry number of a file, or the information that shows that a directory

and a file do not exist to the same layer is recorded on the NeXT entry information. The sector number to continue when this entry constitutes ranging over two or more sectors, or the information which shows that a sector does not continue is recorded on a continuous flag. The identifier of a file is recorded on a file name.

[0050] In addition, this invention is also the program documentation medium which stored the program for realizing all or a part of each function which the equipment of this invention demonstrates.

[0051] Moreover, even if the equipment of this invention realizes all or a part of each function which the equipment realizes in the hard circuit only for the functions, and the software using a computer realizes, it is not cared about.

[0052] In addition, although capacity of one sector was made into 64 bytes in this example, this invention is applicable even if it is the capacity of arbitration. Although [ the management information and File A which were updated by migration of a file etc. ] recorded on the record regenerative apparatus 6, if the updated management information is recorded on the 2nd record medium even before the 2nd record medium is picked out from the record regenerative apparatus 176, it is enough.

[0053] Although the example of an entry was shown in drawing 3 , these are examples, and no information is need, and it is also possible to take in other information. Moreover, the cutting tool/the amount of bits needed for expressing such information are also examples, and the same effectiveness can be acquired even if it uses other values. Although the address of a sector is used as an entry number, this invention is applicable even if it uses other values.

[0054]

[Effect of the Invention] According to this invention, also in magnetic tape media, such as DVC, the data of file format can be dealt with like magnetic-disk media, such as the conventional hard disk, a floppy disk, and CD-ROM, as mentioned above. Moreover, it becomes possible to create the management information for managing the data of file format, and to read the created management information.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The equipment configuration block diagram for realizing the gestalt 1 of operation of this invention

[Drawing 2] A root directory, a directory, the layered structure Fig. of a file

[Drawing 3] Drawing showing the management information constituted from an entry

[Drawing 4] A root directory, a directory, the layered structure Fig. of a file

[Drawing 5] Drawing showing the management information constituted from an entry

[Drawing 6] The equipment configuration block diagram for realizing the gestalt 2 of operation of this invention

[Drawing 7] The record section block diagram in a record medium

[Drawing 8] Recording information in a volume entry

[Drawing 9] Recording information in a directory entry

[Drawing 10] Recording information in a file entry

[Description of Notations]

1 Input Unit

2 Volume Entry Generation Machine

3 Directory Entry Generation Machine

4 File Entry Generation Machine

5 Renewal Machine of Management Information

6 Recording Device

10 Renewal Machine of Management Information

11 1st Are Recording Medium

12 1st Are Recording Media-Administration-Information Output Machine

20 Management Information Ejection Machine

21 Management Information Decoder

22 Display

26 2nd Record Regenerative Apparatus

30 Management Information Generation Equipment

31 Decode Equipment